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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/053,085	11/09/2001	Raymond J. Gorte	PENN.N2437 C	5527

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EXAMINER	
YUAN, DAH WEI D	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 04/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/053,085	GORTE ET AL.	
	Examiner	Art Unit	
	Dah-Wei D. Yuan	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30 and 54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,9-27,30,54* is/are rejected.

7)☒ Claim(s) *7,8,28 and 29* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

USE OF SULFUR-CONTAINING FUELS FOR DIRECT OXIDATION FUEL CELLS

Examiner: Yuan S.N. 10/053,085 Art Unit: 1745 April 21, 2005

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 2, 2005 has been entered. Claims 1,4,20,54 were amended.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued November 2, 2004.

Election/Restrictions

3. Applicant's arguments on the ground that originally presented claims do not recite any species are persuasive, therefore, the restriction requirement is withdrawn. Claims 1-30, 54 are currently examined.

Specification

4. The abstract of the disclosure is objected to because of undue length. The abstract needs to be less than 150 words. Correction is required. See MPEP § 608.01(b).

Claim Objections

5. Claim 20 is objected to because of the following informalities:

It is suggested that change the term "togetherto" to "together to" in line 7.

Appropriate corrections are required.

Claim Rejections - 35 USC § 103

6. The claim rejections under 35 U.S.C. 103(a) as unpatentable over Wallin (US 6,017,647) in view of Anumakonda et al. (US 6,221,280) on claims 1-6,9-27,30 are withdrawn, because the independent claims 1,20 have been amended.

7. The claim rejections under 35 U.S.C. 103(a) as unpatentable over Wallin (US 6,017,647) in view of Fasano et al. (US 6,051,330) on claims 1,2,7,8,20,28,29 are withdrawn, because the independent claims 1,20 have been amended.

8. Claims 1-6,9-27,30,54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorte et al. (US 6,589,680) in view of Annumakonda et al. (US 6,221,280 B1).

With respect to claims 1,20,54, Gorte et al. teach a solid oxide fuel cell comprising an anode of porous YSZ material that is impregnated with a Cu-containing salt solution. The anode can further contain catalytic material, such as ceria. The resulting mixture is pasted onto the electrolyte using glycerol and calcined at 1550°C for two hours. See Column 2, Lines 21-49; Column 4, Lines 1-34.

However, Gorte does not disclose the characteristics of the fuel used for the aforementioned solid oxide fuel cell. Anumakonda et al. teach the use of sulfur-containing heavy hydrocarbon fuels for a solid oxide fuel cell. The hydrocarbon fuel is a liquid hydrocarbon having at least six carbon atoms and a sulfur content of at least 50 ppm. In one embodiment, the JP-8 fuel has a sulfur content of about 3000 ppm. The feed, containing the vaporized fuel and oxygen, is partially oxidized by a catalytic reaction to convert the hydrocarbon to hydrogen and carbon monoxide. As a result, the use of catalytic partial oxidation process to produce fuel enables a simplified overall system design. Furthermore, the product gas can be used as a fuel for a fuel cell system, either directly or after treatment for desulfurization. See Abstract, Column 1, Lines 11-15; Column 4, Lines 7-9,35-39, Column 8, Lines 36-42; Column 11, Lines 58-62. Therefore, it would have been obvious to one of ordinary skill in the art to use a fuel having sulfur content of at least 50 ppm to about 3000 ppm on the solid oxide fuel cell of Gorte, because Anumakonda et al. teach the processing and use of a sulfur-containing hydrocarbon fuel, such as JP-8, to simplify the overall design of a fuel cell system.

With respect to claims 2-6,9, Anumakonda et al. teach the conversion of refinery liquid hydrocarbon fuels, such as gasoline and naphtha, to hydrogen/carbon monoxide gas streams by partial oxidation process. The hydrocarbon fuels further comprises fuels, such as JP-4 jet fuel, JP-5 jet fuel, JP-8 jet fuel, No. 2 fuel oil, diesel oil, kerosene, and decane. See Column 2, Lines 6-18; Column 5, Lines 39-43; column 13, Lines 15-28. Therefore, it would have been obvious to one of ordinary skill in the art to use fuel, including jet fuel, gasoline, naphtha, fuel oil, diesel oil, kerosene, and decane, on the solid oxide fuel cell of Wallin, because Anumakonda et al. teach the processing and use of a sulfur-containing hydrocarbon fuel can simplify the overall design of a fuel cell system.

With respect to claims 10-14, Anumakonda et al. teach the military specification for maximum sulfur content in logistic fuels, such as Jet A, JP-4, JP-5, and JP-8, is 0.3 wt% (3000 ppm). Typically, however, commercially available jet fuels have a total sulfur content of about 0.05-0.07 wt.% (500-700 ppm). See Column 2, Lines 38-44. Therefore, it would have been obvious to one of ordinary skill in the art to use a fuel having sulfur content of at about 500 to about 700 ppm on the solid oxide fuel cell of Wallin, because Anumakonda et al. teach the processing and use of a sulfur-containing hydrocarbon fuel, such as JP-4, JP-5, and JP-8, can simplify the overall design of a fuel cell system.

With respect to claims 15,18, Gorte discloses the electrolyte membrane is a ceramic oxygen ion conductor of yttria-stabilize zirconia. See Example.

With respect to claims 16,17,19, it is well known in the art that ionically conductive materials, such as yttria-stabilized zirconia, scandium-doped zirconia, gadolinium-doped ceria,

and rare earth or alkaline earth-doped $LaAGaO_3$, are functionally equivalent solid electrolyte. See Wallin et al. (US 6,017,647); Column 4, Lines 49-59.

With respect to claims 21-27, Anumakonda et al. teach the conversion of refinery liquid hydrocarbon fuels, such as gasoline and naphtha, to hydrogen/carbon monoxide gas streams by partial oxidation process. The hydrocarbon fuels further comprises fuels, such as JP-4 jet fuel, JP-5 jet fuel, JP-8 jet fuel, No. 2 fuel oil, diesel oil, kerosene and decane. See Column 2, Lines 6-18; Column 9, Lines 1-4; column 13, Lines 15-28. Therefore, it would have been obvious to one of ordinary skill in the art to use fuel, including jet fuel, gasoline, naphtha, fuel oil, diesel oil, kerosene and decane, on the process of Wallin, because Anumakonda et al. teach the processing and use of a sulfur-containing hydrocarbon fuel can simplify the overall design of a fuel cell system.

With respect to claim 30, Anumakonda et al. teach the military specification for maximum sulfur content in logistic fuels, such as Jet A, JP-4, JP-5, and JP-8, is 0.3 wt% (3000 ppm). Typically, however, commercially available jet fuels have a total sulfur content of about 0.05-0.07 wt.% (500-700 ppm). See Column 2, Lines 38-44. Therefore, it would have been obvious to one of ordinary skill in the art to use a fuel having sulfur content of at about 500 to about 700 ppm on the process of Wallin, because Anumakonda et al. teach the processing and use of a sulfur-containing hydrocarbon fuel, such as JP-4, JP-5, and JP-8, can simplify the overall design of a fuel cell system.

9. Claims 1-6,9-19,54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cable et al. (US 5,589,285) in view of Annumakonda et al. (US 6,221,280 B1).

With respect to claims 1,54, Cable et al. teach a solid oxide fuel cell comprising an anode of sulfur tolerant material such as ceria and optionally containing an electronically conducting phase, including Cu. See Column 10, Lines 18-30. It is noted that claims 1,54 are product-by-process claims. "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Since Cable's actual anode material is similar to that of the Applicant's, Applicant's process is not given patentable weight in this claim.

However, Cable does not disclose the characteristics of the fuel used for the aforementioned solid oxide fuel cell. Anumakonda et al. teach the use of sulfur-containing heavy hydrocarbon fuels for a solid oxide fuel cell. The hydrocarbon fuel is a liquid hydrocarbon having at least six carbon atoms and a sulfur content of at least 50 ppm. In one embodiment, the JP-8 fuel has a sulfur content of about 3000 ppm. The feed, containing the vaporized fuel and oxygen, is partially oxidized by a catalytic reaction to convert the hydrocarbon to hydrogen and carbon monoxide. As a result, the use of catalytic partial oxidation process to produce fuel enables a simplified overall system design. Furthermore, the product gas

can be used as a fuel for a fuel cell system, either directly or after treatment for desulfurization. See Abstract, Column 1, Lines 11-15; Column 4, Lines 7-9,35-39, Column 8, Lines 36-42; Column 11, Lines 58-62. Therefore, it would have been obvious to one of ordinary skill in the art to use a fuel having sulfur content of at least 50 ppm to about 3000 ppm on the solid oxide fuel cell of Cable, because Anumakonda et al. teach the processing and use of a sulfur-containing hydrocarbon fuel, such as JP-8, to simplify the overall design of a fuel cell system.

With respect to claims 2-6,9, Anumakonda et al. teach the conversion of refinery liquid hydrocarbon fuels, such as gasoline and naphtha, to hydrogen/carbon monoxide gas streams by partial oxidation process. The hydrocarbon fuels further comprises fuels, such as JP-4 jet fuel, JP-5 jet fuel, JP-8 jet fuel, No. 2 fuel oil, diesel oil, kerosene, and decane. See Column 2, Lines 6-18; Column 5, Lines 39-43; column 13, Lines 15-28. Therefore, it would have been obvious to one of ordinary skill in the art to use fuel, including jet fuel, gasoline, naphtha, fuel oil, diesel oil, kerosene, and decane, on the solid oxide fuel cell of Wallin, because Anumakonda et al. teach the processing and use of a sulfur-containing hydrocarbon fuel can simplify the overall design of a fuel cell system.

With respect to claims 10-14, Anumakonda et al. teach the military specification for maximum sulfur content in logistic fuels, such as Jet A, JP-4, JP-5, and JP-8, is 0.3 wt% (3000 ppm). Typically, however, commercially available jet fuels have a total sulfur content of about 0.05-0.07 wt.% (500-700 ppm). See Column 2, Lines 38-44. Therefore, it would have been obvious to one of ordinary skill in the art to use a fuel having sulfur content of at about 500 to about 700 ppm on the solid oxide fuel cell of Wallin, because Anumakonda et al. teach the

processing and use of a sulfur-containing hydrocarbon fuel, such as JP-4, JP-5, and JP-8, can simplify the overall design of a fuel cell system.

With respect to claims 15,18, Gorte discloses the electrolyte membrane is a ceramic oxygen ion conductor of yttria-stabilize zirconia. See Example.

With respect to claims 16,17,19, it is well known in the art that ionically conductive materials, such as yttria-stabilized zirconia, scandium-doped zirconia, gadolinium-doped ceria, and rare earth or alkaline earth-doped $LaAGaO_3$, are functionally equivalent solid electrolyte. See Wallin et al. (US 6,017,647); Column 4, Lines 49-59.

Allowable Subject Matter

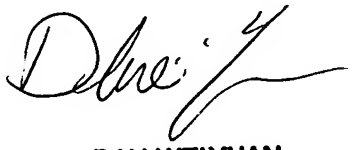
10. Claims 7,8,28,29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 7,28,29 would be allowable because the prior art does not disclose or suggest the hydrocarbon comprises an alcohol.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dah-Wei D. Yuan whose telephone number is (571) 272-1295. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Dah-Wei D. Yuan
April 21, 2005



DAH-WEI YUAN
PRIMARY EXAMINER